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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,509	03/29/2004	Hans-Georg Frohlich	543822004300	8930
25227	7590	03/25/2005	EXAMINER	
MORRISON & FOERSTER LLP			BARRECA, NICOLE M	
1650 TYSONS BOULEVARD			ART UNIT	
SUITE 300			PAPER NUMBER	
MCLEAN, VA 22102			1756	

DATE MAILED: 03/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/811,509

Applicant(s)

FROHLICH ET AL.

Examiner

Nicole M Barreca

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 24 and 25 is/are allowed.
- 6) ☒ Claim(s) 1-13, 16-23 and 26-30 is/are rejected.
- 7) ☒ Claim(s) 14 and 15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>9/10/04</u> . | 6) <input type="checkbox"/> Other: ____.  |

### **DETAILED ACTION**

1. Claims 1-30 are pending in this application.

#### ***Drawings***

2. Figures 4A-4D should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.121(d)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### ***Specification***

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

The abstract should be amended to be less than 150 words.

#### ***Claim Objections***

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4. Claim 3 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 2 already limited the liner layer to include silicon nitride.

***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 2-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Step F2 in claim 2 and step H in claim 1 both recite removing the uncovered insulator layer from between the gate electrodes. It is therefore unclear when the insulating layer is removed and/or if there is more than one removal step for the insulating layer in the method.

***Claim Rejections - 35 USC § 102***

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-5, 8, 10, 11, 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Doan (US 6,057,581).

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9. Silicon wafer 201 includes substrate 200 including a plurality of gate stack structures 202 with sidewall spacers (liner) and doped source/drain regions 204 (step A, F3, F4) (col.5, 6-20). Conformal layer 220 is formed as an etch stop layer, preferably formed of silicon dioxide (insulator layer) (step B) (col.5, 53-65). Sacrificial layer 222 of polysilicon is deposited to a sufficient thickness to fill all the gaps between the adjacent gate structures and planarized (step C, C1', C2') (col.5, 17-51). A layer of masking material 224, such as photoresist is then deposited and patterned to form material plugs (step D, D1-D3). These plugs are used as a mask to etch the poly layer 222 (step E) (col.5, 52-67). Insulating layer 226 (vitreous layer) is deposited on top of the wafer to a sufficient thickness to cover the upper surface 223 of the sacrificial plug 222A and to fill the gap between adjacent plugs. This insulting layer 226 is preferably BPSG (step F, F5) (col.7, 13-29). After removal of remaining photoresist 224A (step F1), insulating layer 226 is then planarized using CMP until a top surface of the poly plug 222A is exposed (step F6). Poly plug 222A is etched from opening 228 to expose etch stop layer 220 (step G). Following the removal of the poly plug, the etch stop layer is stripped from the contact opening (step F2, H) (col.7, 38-col.8, 22). Conductive material 240 is filled in the contact opening (step I) (col.8, 44-52). See col.5, 5-col.8, 52 and figures 2A-3.

***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. Claims 6, 7, 9, 12, 13, 17, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doan as applied to claim 1 above, and further in view of Thakar (US 6,624,068).

12. Claims 19-23, 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Doan in view of Thakar.

13. The teachings of Thakar have been discussed previously. The reference discloses a first sacrificial layer of polysilicon but does not disclose an additional (second) sacrificial, hard mask or ARC layer between the photoresist and the (first) sacrificial polysilicon layer. Thakar teaches that sandwiching an ARC/hard mask layer between polysilicon and photoresist layers will help to accurately define the precise polysilicon features (col.1, 1-col.2, 50). It would have been obvious to one of ordinary skill in the art to use an additional sacrificial layer, such as an ARC/hard mask between the first sacrificial and photoresist layers in the method of Doan because Thakar teaches that such an additional layer will help to accurately define precise features in the polysilicon layer. The references do not disclose that the thickness of the sacrificial layers is 200-1000 nm above the gate tracks. However the thickness of such a layer is a result-effective variable. It would be within the ordinary skill of one in the art to determine the optimal film thickness of the sacrificial layers by routine experimentation and to have a thickness of 200-1000 nm above the gate tracks, if required, because layer thickness is a result-effective variable and the discovery of an optimum value of a result effective variable is ordinary within the skill of the art, as taught by *In re Boesch*, (617 F.2d 272,

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205 USPQ 215 (CCPA 1980)).

***Allowable Subject Matter***

14. Claims 24-25 are allowed.

15. Claims 14-15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

16. The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach or suggest a method for fabricating a contact hole in a memory module including all the process steps A-I and wherein the material plugs are formed on the sacrificial layer by introducing a filling material into the etched openings of the hard mask layer as recited in steps D1"-D9".

***Conclusion***

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M Barreca whose telephone number is 571-272-1379. The examiner can normally be reached on Monday-Thursday (9AM-7PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nicole M Barreca  
Examiner  
Art Unit 1756



3/16/05